# News

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## NEW ENGLAND OCCUPATIONAL PAY RELATIVES, 2004

The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor has produced occupational "pay relatives" to facilitate comparisons of occupational pay between metropolitan areas and the United States as a whole. BLS periodically has issued occupational pay relatives using data from the National Compensation Survey (NCS) and its predecessor surveys, and now plans to publish them annually. Using data for 2004 from the NCS, pay relatives have been prepared for each of 9 major occupational groups within 4 New England Metropolitan Statistical Areas (MSAs), as well as averaged across all occupations for each area. The published New England MSAs are Boston-Worcester-Lawrence, MA-NH-ME-CT; Hartford, CT; Providence-Fall River-Warwick, RI-MA; and Springfield, MA. Pay relatives averaged across all occupations were significantly different from the national average in all 4 New England MSAs. Among the four published MSAs, Springfield, MA was the only area to have a pay relative below the national average. Pay relatives were significantly higher than the national average in almost all major occupational groups in the four published metropolitan areas. Installation, maintenance, and repair workers in Providence and transportation and material moving workers in Springfield were the exception, earning less than the national average. Pay relatives for four occupational groups reported among the four published areas were not significantly different from the national average (table 1).

The pay relative in 2004 averaged across all occupations for workers in the Hartford MSA was 113, meaning that pay on average was 13 percent more in that area than for the nation as a whole (table 1). The pay relative of workers within construction and extraction occupations in the Hartford MSA was 138, therefore, the pay in Hartford for that occupational group averaged 38 percent more than the national average pay for workers in that occupational group. By contrast, the pay relative averaged across all occupations for workers in the Springfield MSA was 94 and so, pay on average in Springfield was 6 percent below the national average. The pay relative of workers within the aforementioned transportation and material moving jobs in the Springfield MSA was 65 or 35 percent less pay than the national average for workers in that occupational group. The pay relatives averaged for workers in all occupations in Hartford (113) and Springfield (94) were respectively the highest and lowest among the four New England areas. In addition to these examples of area-to-national comparisons, area-to-area comparisons can be derived using these pay relatives.

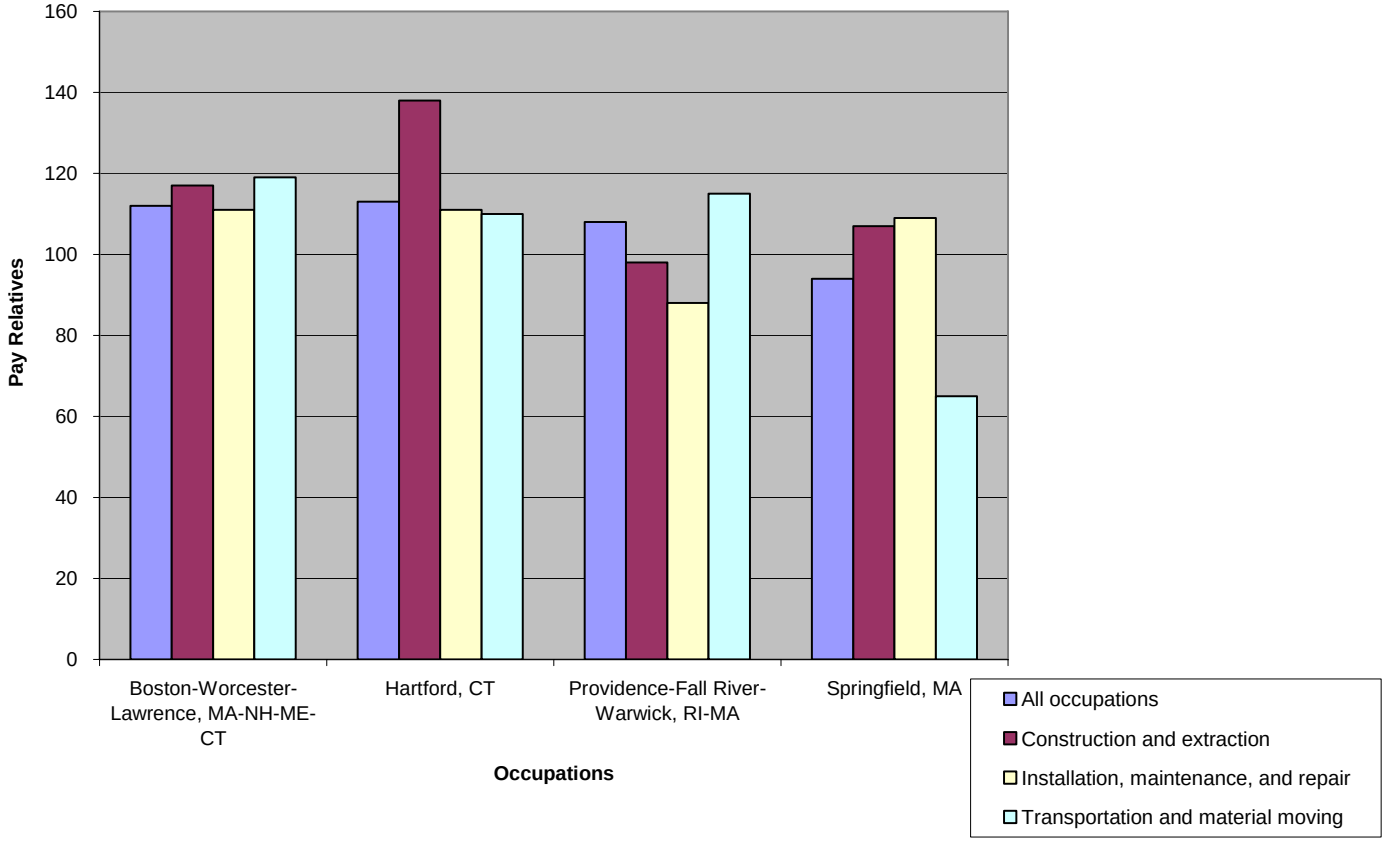
In Boston, the pay relative averaged across all occupations was 112. The pay relative of workers within transportation and material moving jobs in Boston posted 119 meaning workers within this occupational

group earned 19 percent more than the national average. Workers in Providence also earned more than the national average with a pay relative of 108 averaged across all occupation groups. Service workers in this area earned 17 percent more than the national average for workers within this occupational group. By contrast, installation, maintenance, and repair workers in Providence earned 12 percent less than the national average for like workers.

Pay relatives for three major occupational groups published for the New England area—transportation and material moving, construction and extraction, and installation, maintenance, and repair--posted notable disparities between areas. For example, the pay relative for workers within transportation and material moving occupations in Boston was 19 percent higher than the national average, whereas in Springfield such workers earned 35 percent less than nationally, registering a pay relative of 65 (chart 1). For workers employed in construction and extraction jobs, the pay relative in Hartford posted 138 compared with a pay relative of 98 in Providence. The pay relatives for workers within installation, maintenance, and repair occupations in both Boston and Hartford were 11 percent higher than the national average, posting a pay relative of 111 in each area. By contrast, the pay relative for such workers in the Providence area was 88, meaning like workers earned 12 percent less than the national average.

The National Compensation Survey (NCS), introduced in 1997, collects earnings and other data on employee compensation covering over 820 detailed occupations in 152 metropolitan and non-metropolitan areas. Average occupational earnings from the NCS are published annually for more than 80 metropolitan areas and for the United States as a whole.

**Chart 1**
**Occupational Pay Relatives 2004**
**US = 100**



**What is a pay relative?**

A pay relative is a calculation of pay--wages, salaries, commissions, and production bonuses--for a given metropolitan area relative to the nation as a whole. The calculation controls for differences among areas in occupational composition, establishment and occupational characteristics, and the fact that data are collected for areas at different times during the year.

Metropolitan areas differ greatly in the types of occupations that are available to the local workforce. For example, the proportion of Boston's workers who are employed as computer programmers is approximately 16 percent greater than the national average[1]. Similarly, the composition of establishment and occupational characteristics--such as whether an establishment is for profit or not-for-profit or whether an occupation is union or nonunion--varies by area. In addition to these factors, the NCS collects compensation data for metropolitan areas at different times during the year. Payroll reference dates differ between areas which makes direct comparisons between areas difficult.

The pay relative approach controls for these differences to isolate the geographic effect on wage determination. To illustrate the importance of controlling for these effects, consider the following example. The average pay for professional workers in Boston is $33.02 and the average pay for professional workers in the entire US is $29.40[2]. A simple pay comparison can be calculated from the ratio of the two average pay levels, multiplied by 100 to express the comparison as a percentage. The pay comparison in the example is calculated as:

($33.02/$29.40) X 100 = 112

However, this comparison does not control for the interarea difference in occupational composition. Some of the 12 percent pay premium in Boston relative to the nation as a whole is due to the higher concentration of highly compensated professional workers--such as computer programmers--in Boston. A more accurate estimate of the geographic effect on wage determination in Boston can be obtained by taking into account this and other differences. Controlling for the differences in occupation composition, establishment and occupational characteristics, and the payroll reference date in Boston relative to the nation as the whole, the pay relative for professional occupations in Boston is equal to 109.

**Using multivariate regression analysis**

A statistical technique called multivariate regression analysis controls for interarea differences. It controls for the following ten characteristics:

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[1] The proportion of computer programmers in Boston relative to the nation as a whole was calculated using total employment estimates found in the November 2004 Metropolitan Area Occupational Employment and Wage Estimates publication, http://www.bls.gov/oes/current/oessrcma.htm.

[2] Average pay for professional workers in Boston and for the United States are based on wage estimates published in the Boston-Worcester-Lawrence, MA-NH-ME-CT National Compensation Survey, September 2004 and the National Compensation Survey: Occupational Wages in the United States, July 2004, http://www.bls.gov/ncs/ocs/compub.htm.

- Occupational type
- Industry type
- Work level
- Full-time / part-time status
- Time / incentive status
- Union / nonunion status
- Ownership type
- Profit / non-profit status
- Establishment employment
- Payroll reference date

Even accounting for these characteristics, there is still significant wage variation across the areas. The variation is due to differences in wage determinants that were not included in the model. Examples of these determinants include price levels, environmental amenities such as a pleasant climate, and cultural amenities.

An additional feature of this type of analysis is the ability to perform statistical significance tests. An asterisk (*) in the table indicates that the pay relative is statistically significant (i.e., the pay for the given occupation in that area is too different from the national average to be accounted for by the randomness of the survey's sample).

For more detailed information on the pay relative methodology, see Maury B. Gittleman, "Pay Relatives for Metropolitan Areas in the U.S." Monthly Labor Review, March 2005, pp. 46-53.

**Results**

Table 1 presents July 2004 pay relatives for all occupations covered by the NCS survey and nine occupational groups in the four published New England metropolitan areas. This table represents the first presentation of NCS wage data using the 2000 Standard Occupational Classification System (SOC). For more detailed information on SOC, see the BLS website: http://www.bls.gov/soc/home.htm.

The occupational groups are:

(1) management, business, and financial occupations
(2) professional and related occupations
(3) service occupations
(4) sales and related occupations
(5) office and administrative support occupations
(6) construction and extraction occupations
(7) installation, maintenance, and repair occupations
(8) production occupations
(9) transportation and material movement occupations

**Comparisons between areas**

The pay relatives presented in Table 1 are area-to-national comparisons. However, it is easy to derive area-to-area comparisons from them. To do so, divide the pay relative for the occupational group and area in question by the pay relative for the same occupational

group in the area to which the first is being compared. Then multiply the result by 100 so that the comparison is expressed as a percentage.

For example, the pay relative for professional occupations in Providence is 110 and the pay relative for professional occupations in Springfield is 107. The Providence-to-Springfield pay relative for professional occupations is calculated as:

(110/107) X 100 = 103

In the example, there is approximately a 3 percent pay premium for professional occupations in Providence relative to the same occupational group in Springfield. However, there is no significance test for area-to-area comparisons calculated this way. The difference in average pay between Providence and Springfield in the example may or may not be statistically significant.

**Differences between the 2004 pay relatives and historical pay relatives**

Historical pay relative data are available for 2002[3], 1998[4], and 1992-1996[5]. There are several differences between the 2004 pay relatives and the historical pay relatives, including different industry and occupation classification systems, varying methodology, and different survey designs. These differences limit comparability.

The 2004 pay relatives use the 2002 North American Industry Classification System (NAICS) to define industry type. Occupation type and the occupational groups presented in Table 1 are defined using the Standard Occupation Classification (SOC). The 2002 and 1992-1996 pay relatives defined industry type using the Standard Industry Classification (SIC) system. Occupation type and occupational groups for the 2002, 1998, and 1992-1996 pay relatives were defined using the Occupational Classification System (OCS).

The 2004 and 2002 pay relatives used a similar multivariate regression technique methodology to calculate pay relatives. The 1998 and 1992-1996 pay relatives were calculated using a weighted cell means methodology. The methodology controlled for fewer characteristics:

- Occupational type
- Work level
- Payroll reference date

The 2004, 2002, and 1998 pay relatives were derived from the National Compensation Survey (NCS). The 1992-1996 pay relatives were derived from the Occupational Compensation Survey (OCS). The NCS and OCS have significantly different sample designs. For example, the OCS collected wage data for sampled establishments with 50 or more employees. The NCS collects data for all sampled establishments. Additionally, the OCS collected wage data for a fixed list of jobs. The NCS collects wage data for randomly selected jobs.

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[3] For more information, see Maury B. Gittleman, "Pay Relatives for Metropolitan Areas in the U.S." Monthly Labor Review, March 2005, pp. 46-53.

[4] For more information, see Parastou Karen Shahpoori, "Pay Relatives for Major Metropolitan Areas," Compensation and Working Conditions, Spring 2003.

[5] For more information, see the Occupational Compensation Survey Publications List (1992 - 1996), http://www.bls.gov/ncs/ocspubs.htm.

**TABLE 1. Pay relatives for major occupational groups in New England metropolitan areas, National Compensation Survey, July 2004**
(Average pay for all occupations nationally = 100. Average pay nationally for each occupational group shown = 100.)

| New England Metropolitan Area[1] | All occupations | Management, business, and financial | Professional and related | Service | Sales and related | Office and administrative support | Construction and extraction | Installation, maintenance, and repair | Production | Transportation and material moving |
|---|---|---|---|---|---|---|---|---|---|---|
| **United States** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |
| Boston-Worcester-Lawrence, MA-NH-ME-CT | 112* | 110* | 109* | 114* | 106 | 117* | 117* | 111* | 109* | 119* |
| Hartford, CT | 113* | 107* | 109* | 124 | 114* | 111* | 138* | 111* | 112* | 110* |
| Providence-Fall River-Warwick, RI-MA | 108* | 103* | 110* | 117* | 113* | 109* | 98 | 88* | 100 | 115* |
| Springfield, MA | 94* | 103* | 107* | 106* | 110* | 110* | 107* | 109* | 110* | 65* |

* The pay relative for this area is significantly different from the national average of all areas at the 10% level of significance. For additional details, see the technical note.

[1] A metropolitan area can be a Metropolitan Statistical Area (MSA) or Consolidated Metropolitan Statistical Area (CMSA) as defined by the Office of Management and Budget, 1994

**Technical Note**

Because the NCS is a sample survey, pay relatives derived from NCS are subject to sampling error. Sampling error for pay relatives are differences that occur between the pay relatives estimated from the sample and the true pay relatives derived from the population. Pay relatives estimated from different samples selected using the same sample design may differ from one another.

It is important to assess whether differences between each pay relative and the pay relative for the nation as a whole is likely to be the result of sampling error or of true differences in pay levels. Those areas whose difference is likely to be due to true differences in pay levels are denoted with an asterisk (*) in Table 1.

To perform this assessment a test of statistical significance is conducted. The test constructs a 90-percent confidence interval that assumes the given area's true pay relative is equal to the national average. The confidence interval is constructed so that there is a 90 percent probability the pay relative calculated from any one sample is contained within the confidence interval. If from a single sample a calculated pay relative falls within the confidence interval, then the pay relative is not statistically significant and the hypothesis that the true pay relative is equal to the national average is accepted. However, if the pay relative falls outside of the constructed confidence interval then the pay relative is statistically significant at the 10-percent level. The hypothesis that the given area's pay relative is equal to the pay relative for the nation is rejected and one can conclude with reasonable confidence that the true pay relative is different from the national average.

In addition to sampling error, pay relatives are subject to a variety of sources that can adversely influence the estimates. The NCS may be unable to obtain information for some establishments; there may be difficulties with survey definitions; respondents may be unable to provide correct information, or mistakes in recording or coding the data may occur. Non-sampling errors of these kinds were not specifically measured. However, they are expected to be minimal due to the extensive training of the field economists who gathered the survey data, computer edits of the data, and detailed data review.

The pay relative regression methodology introduces another type of error. Regression models are subject to specification error. The significance test does not specifically measure specification error. However, care was taken to minimize this form of error by an extensive search across specifications for the model that performs best in terms of predictive accuracy.

For more details on the statistical significance test, see Maury B. Gittleman, "Pay Relatives for Metropolitan Areas in the U.S." Monthly Labor Review, March 2005, pp. 46-53.